TRANSLATION

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(54) Title:
REFRIGERANT MIXTURE

(57) Summary

The invention concerns a refrigerant mixture which is used in semi- and fully closed refrigeration cycles and which contains no chlorinated hydrocarbon refrigerant which could damage the ozone of the earth's atmosphere.

According to the invention the refrigerant R134a is used with 10-20 vol.% of a hydrocarbon compound as a secondary component. The advantages of the use of the refrigerant mixture according to the invention are improvement of refrigerating capacity and of the performance index compared to R12. This mixture also has the advantage that conventional refrigerator oils such as mineral oils or oils based on polyalkylbenzenes may be used.

Description

The invention pertains to a refrigerant mixture which may be used especially in the half- and fully-closed refrigeration cycles and which contains no ozone-depleting fluorochlorocarbons.

The HFHC refrigerant F134a has been favored as an alternative to the refrigerant R12 which is being phased out.

The use of R134a, however, involves the following disadvantages: the refrigerating power diminishes with decreasing temperature of evaporation proportionally more slowly than in the case of R12 while the driving power for the compressor remains unchanged or even displays a slightly increasing tendency. As a result, the performance index of the cyclic process is impaired and the energy cost increases.

The miscibility of chlorine-free refrigerants in conventional refrigerator oils such as mineral oils or oils based on polyalkylbenzenes is not sufficient. Synthetic oils based on esters appear to be suitable for R134a for which substantially higher costs must be expected.

The purpose of the invention is to devise a refrigerant mixture which, based on a FHC or HFHC refrigerant, preferably refrigerant R134a, above all in the range of low temperatures of evaporation, permits refrigeration capacities and performance indices to be expected which are at least of the same order as those of R12.

The problem of the invention is solved by the features of the claims.

The advantages of the use of the refrigerant mixture according to the invention are an improvement of the refrigeration capacity and performance index compared to R12. As a result

one avoids the necessity of modification of motor and compressor, which is especially significant for existing installations.

Another advantage arises above all during the re-equipping of existing refrigeration systems for the new refrigerant. Since the secondary components of the proposed mixtures contribute to improving the oil solubility conditions for nonchlorinated refrigerants in earlier R-12 oils, the costly conversion of the systems to the new oils can be avoided.

Also the practical questions arising from the higher moisture content of ester oils may be disregarded.

The choice of the mixing partners and their concentration is also made from the aspect of minimizing the temperature bands during the phase change so that the mixtures behave only as pure refrigerants in practical operation.

In the following example of embodiment the thermal and caloric magnitudes for 20 wt.% of the secondary components in the mixture with R134a for -30°C evaporation temperature are presented and compared with R-12 and R-134a.

	Pressure Ratio π	Temperature band of evaporation Δt_0,degrees	Volumetric refrigeration capacity q_0/v_0, kJ/m^3	Isentropic performance index $\_s$
R134a	12.0	-	549	1.86
R12	9.6	-	626	1.95
R134a/ dimethyl ether (C_2H_6O)	11.6	0.02	563	1.93
R134a/ propane (C_3H_8)	10.4	2.3	628	1.86
R134a/ propylene (C_3H_6)	10.2	2.5	690	1.85

It is known that not all of the resulting practical properties and effects of the refrigerant mixture/refrigerator oil can be theoretically predicted.

In the calorimeter tests therefore for the mixture R134a/dimethyl ether in the concentration range according to the invention, for the conditions -30°C evaporation temperature/40°C condensation temperature -- an improvement in the performance index of up to 12% could be determined compared to R-12 operation.

The cyclic process was first operated with R134a and R12 oil. By adding the secondary component dimethyl ether to R134a the above observed demixing phenomena could be eliminated immediately and completely.

Claims

1. Refrigerant mixture for use in half-closed and fully closed refrigeration cycles characterized by the fact that 10-20 wt.% of a hydrocarbon compound are added as a secondary component to the refrigerant 1,1,1,2-tetrafluorethane (R134a).

2. Refrigerant mixture as in Claim 1 characterized by the fact that dimethyl ether (C_2H_6O) is added as the secondary component.

3. Refrigerant mixture as in Claim 1 characterized by the fact that propane (C_3H_8) is added as the secondary component.

4. Refrigerant mixture as in Claim 1 characterized by the fact that propylene (C_4H_6) is added as the secondary component.

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